

WHAT IS CLAIMED IS:

- 1 1. A system for removing contaminants from a contaminated air stream received from
2 a surrounding environment to produce purified or ozone enriched air comprising:
3 an air intake to receive an air stream from the surrounding environment;
4 an ozone chamber including an ozone generating radiation source for irradiating the
5 air stream to produce ozone to remove contaminants from within the air stream, and ozone
6 distribution means for delaying said air stream by increasing residence time of said air stream
7 in said ozone chamber to facilitate interaction and mixing of the produced ozone with the air
8 stream to enhance removal of contaminants from within the air stream;
9 a germicidal chamber for receiving said air stream from said ozone chamber and
10 including a germicidal radiation source for irradiating the air stream to remove residual
11 contaminants and ozone therefrom;
12 an exhaust to return the air stream from said germicidal chamber to the surrounding
13 environment; and
14 air flow control means for directing the air stream to flow through said system.

- 1 2. The system of claim 1 further including:
2 a power source to provide power to said ozone generating radiation source and said
3 germicidal radiation source;
4 an end-cap disposed at an end of the ozone generating radiation source, wherein said
5 end-cap includes connectors to provide power to said ozone generating radiation source from
6 said power source; and
7 a guide mechanism to align said end-cap in a proper position to facilitate a connection
8 between said end-cap and said power source.

- 1 3. The system of claim 1 further including:
2 an end-cap disposed coincident at least a portion of the ozone generating radiation
3 source, wherein said end-cap includes a configuration to regulate emission of radiation from
4 said ozone generating radiation source to control production of ozone within the ozone
5 chamber.

1 4. The system of claim 1 further including:
2 a germicidal treatment chamber for receiving said air stream from said air intake and
3 including a germicidal treatment radiation source for irradiating the air stream to remove
4 contaminants from within the air stream, wherein said ozone chamber receives said air stream
5 from said germicidal treatment chamber.

1 5. The system of claim 1 wherein:
2 said ozone distribution means includes a plurality of ozone chamber baffles
3 collectively configured to direct said air stream in a serpentine fashion through said ozone
4 chamber; and
5 said germicidal chamber further includes a plurality of germicidal chamber baffles
6 collectively configured to direct said air stream in a serpentine fashion through said
7 germicidal chamber.

1 6. The system of claim 5 further including:
2 a plurality of radiation baffles disposed proximate said germicidal chamber and
3 configured to collectively maintain radiation emitted by said germicidal radiation source
4 within said system.

1 7. The system of claim 1 wherein said surrounding environment is a duct of an air
2 treatment system, and said air intake includes means for receiving said air stream from said
3 air treatment system duct.

1 8. The system of claim 7 wherein said air treatment system duct includes a humidifier,
2 and said air intake includes means for receiving said air stream from said humidifier.

1 9. The system of claim 1 wherein said surrounding environment is an interior of a
2 humidifier unit, and said air intake includes means for receiving said air stream from said
3 humidifier unit interior.

1 10. A system for removing contaminants from a contaminated air stream received
2 from a surrounding environment to produce purified or ozone enriched air comprising:
3 a replaceable cartridge disposed within said surrounding environment, wherein said
4 cartridge includes:
5 an air intake to receive an air stream from the surrounding environment;
6 an ozone chamber including an ozone generating radiation source for
7 irradiating the air stream to produce ozone to remove contaminants from within the air
8 stream, and ozone distribution means for delaying said air stream by increasing
9 residence time of said air stream in said ozone chamber to facilitate interaction and
10 mixing of the produced ozone with the air stream to enhance removal of contaminants
11 from within the air stream;
12 a germicidal chamber for receiving said air stream from said ozone chamber
13 and including a germicidal radiation source for irradiating the air stream to remove
14 residual contaminants and ozone therefrom;
15 an exhaust to return the air stream from said germicidal chamber to the
16 surrounding environment; and
17 a connector to connect said cartridge to a power source.

1 11. The system of claim 10 further including:
2 a base for disposal in said surrounding environment, wherein said base includes:
3 air flow control means for directing the air stream to flow through said system;
4 and
5 said power source for interfacing said connector to provide power to said
6 system;
7 wherein said replaceable cartridge is removably attached to said base.

1 12. The system of claim 10 further including an end-cap disposed at an end of said
2 ozone generating radiation source, wherein said end-cap is configured to maintain said ozone
3 generating radiation source away from walls of said cartridge.

1 13. A system for producing ozone enriched air to remove contaminants from liquids
2 comprising:
3 a liquid inlet to receive liquid from a surrounding environment;
4 a liquid channel for receiving said liquid from said inlet and directing said liquid
5 through said system;
6 an ozone chamber including:
7 air flow control means for directing an air stream through said ozone chamber;
8 an ozone generating radiation source for irradiating the air stream to produce
9 ozone to remove contaminants from within the air stream;
10 ozone distribution means for delaying said air stream by increasing residence
11 time of said air stream in said ozone chamber to facilitate interaction and mixing of
12 the produced ozone with the air stream to enhance removal of contaminants from
13 within the air stream; and
14 an injector disposed proximate said liquid channel to introduce ozone from
15 said ozone chamber into said liquid;
16 a germicidal chamber including a germicidal radiation source for irradiating said
17 ozonated liquid within said liquid channel to remove residual contaminants and at least a
18 portion of ozone therefrom; and
19 a liquid outlet to return said treated liquid to said surrounding environment.

1 15. In an air sterilization system having an air intake, ozone and germicidal chambers
2 and an exhaust, a method of removing contaminants from a contaminated air stream received
3 from a surrounding environment to produce purified or ozone enriched air comprising the
4 steps of:

5 (a) receiving an air stream from the surrounding environment;
6 (b) directing the air stream to flow through the system;
7 (c) irradiating the air stream within the ozone chamber via an ozone generating
8 radiation source to produce ozone to remove contaminants from within the air stream;
9 (d) delaying said air stream by increasing residence time of said air stream in said
10 ozone chamber to facilitate interaction and mixing of the produced ozone with the air stream
11 to enhance removal of contaminants from within the air stream;
12 (e) irradiating the air stream received from the ozone chamber within a germicidal
13 chamber via a germicidal radiation source to remove residual contaminants and ozone
14 therefrom; and
15 (f) returning the air stream from said germicidal chamber to the surrounding
16 environment.

1 16. The method of claim 15 wherein said air sterilization system further includes a
2 power source to provide power to said ozone generating radiation source and said germicidal
3 radiation source, wherein said ozone generating radiation source includes an end-cap having
4 connectors to provide power to said ozone generating radiation source from said power
5 source, and step (c) further includes:

6 (c.1) aligning said end-cap in a proper position, via a guiding mechanism, to facilitate
7 a connection between said end-cap and said power source.

1 17. The method of claim 15 wherein an end-cap is disposed coincident at least a
2 portion of the ozone generating radiation source, and step (c) further includes:

3 (c.1) regulating emission of radiation from said ozone generating radiation source via
4 said end-cap to control production of ozone within the ozone chamber.

1 18. The method of claim 15 wherein said air sterilization system further includes a
2 germicidal treatment chamber, and step (b) further includes:

3 (b.l) receiving said air stream from said surrounding environment and irradiating the
4 air stream within the germicidal treatment chamber via a germicidal treatment radiation
5 source to remove contaminants from within the air stream;

6 and step (c) further includes:

7 (c.l) receiving said air stream from said germicidal treatment chamber.

1 19. The method of claim 15 wherein said ozone chamber includes a plurality of ozone
2 chamber baffles, said germicidal chamber includes a plurality of germicidal chamber baffles,
3 and step (c) further includes:

4 (c.l) directing said air stream in a serpentine fashion through said ozone chamber via
5 said ozone chamber baffles; and

6 step (e) further includes:

7 (e.l) directing said air stream in a serpentine fashion through said germicidal chamber
8 via said germicidal chamber baffles.

1 20. The method of claim 19 wherein said air sterilization system further includes a
2 plurality of radiation baffles disposed proximate said germicidal chamber, and step (e) further
3 includes:

4 (e.2) maintaining radiation emitted by said germicidal radiation source within said
5 system via said radiation baffles.

1 21. The method of claim 15 wherein said surrounding environment is a duct of an air
2 treatment system, and step (a) further includes:

3 (a.l) receiving said air stream from said air treatment system duct.

1 22. The method of claim 21 wherein said air thermal treatment system duct includes a
2 humidifier, and step (a.1) further includes:

3 (a.1.1) receiving said air stream from said humidifier.

1 23. The method of claim 15 wherein said surrounding environment is an interior of a
2 humidifier unit, and step (a) further includes:
3 (a.1) receiving said air stream from said humidifier unit interior.

1 24. In an air sterilization system including a replaceable cartridge having an air
2 intake, ozone and germicidal chambers, an exhaust and a connector to connect the cartridge to
3 a power source, a method of removing contaminants from a contaminated air stream received
4 from a surrounding environment to produce purified or ozone enriched air comprising the
5 steps of:

- 6 (a) disposing the cartridge within said surrounding environment;
- 7 (b) interfacing the connector to the power source;
- 8 (c) receiving an air stream into the cartridge from the surrounding environment;
- 9 (d) irradiating the air stream within the ozone chamber to produce ozone to remove
10 contaminants from within the air stream;
- 11 (e) delaying said air stream by increasing residence time of said air stream in said
12 ozone chamber to facilitate interaction and mixing of the produced ozone with the air stream
13 to enhance removal of contaminants from within the air stream;
- 14 (f) irradiating the air stream received from the ozone chamber within the germicidal
15 chamber to remove residual contaminants and ozone therefrom;
- 16 (g) returning the air stream from said germicidal chamber to the surrounding
17 environment; and
- 18 (h) periodically replacing the cartridge within the surrounding environment.

1 25. The method of claim 24 wherein said air sterilization system further includes a
2 base having air flow control means for directing air through said system and said power
3 source, and step (a) further includes:

- 4 (a.1) disposing the base within the surrounding environment;
- 5 (a.2) removably attaching the cartridge to the base; and
- 6 (a.3) directing the air stream through the system via the air flow control means.

1 26. The method of claim 24 wherein the air sterilization system further includes an
2 end-cap disposed at an end of said ozone generating radiation source, and step (d) further
3 includes:

4 (d.1) maintaining said ozone generating radiation source away from walls of said
5 cartridge via said end-cap.

1 27. In a liquid sterilization system having an inlet, a liquid channel, ozone and
2 germicidal chambers, an injector and an outlet, a method of producing ozone enriched air to
3 remove contaminants from liquids comprising the steps of:

4 (a) receiving liquid from a surrounding environment;
5 (b) directing said liquid from said inlet through said system via said liquid channel;
6 (c) directing air from the surrounding environment through said ozone chamber;
7 (d) irradiating the air stream within the ozone chamber to produce ozone to remove
8 contaminants from within the air stream;

9 (e) delaying said air stream by increasing residence time of said air stream in said
10 ozone chamber to facilitate interaction and mixing of the produced ozone with the air stream
11 to enhance removal of contaminants from within the air stream;

12 (f) introducing ozone from said ozone chamber into said liquid in said liquid channel
13 via said injector;

14 (g) irradiating said ozonated liquid within said liquid channel in the germicidal
15 chamber to remove residual contaminants and at least a portion of ozone therefrom; and

16 (h) returning said treated liquid to said surrounding environment.

1 28. The method of claim 27 wherein said liquid sterilization system further includes
2 an applicator for receiving said treated liquid from said outlet, wherein said treated liquid
3 includes a predetermined concentration level of ozone, said method further including the step
4 of:

5 (i) applying said ozonated liquid to objects via said applicator to remove contaminants
6 therefrom.